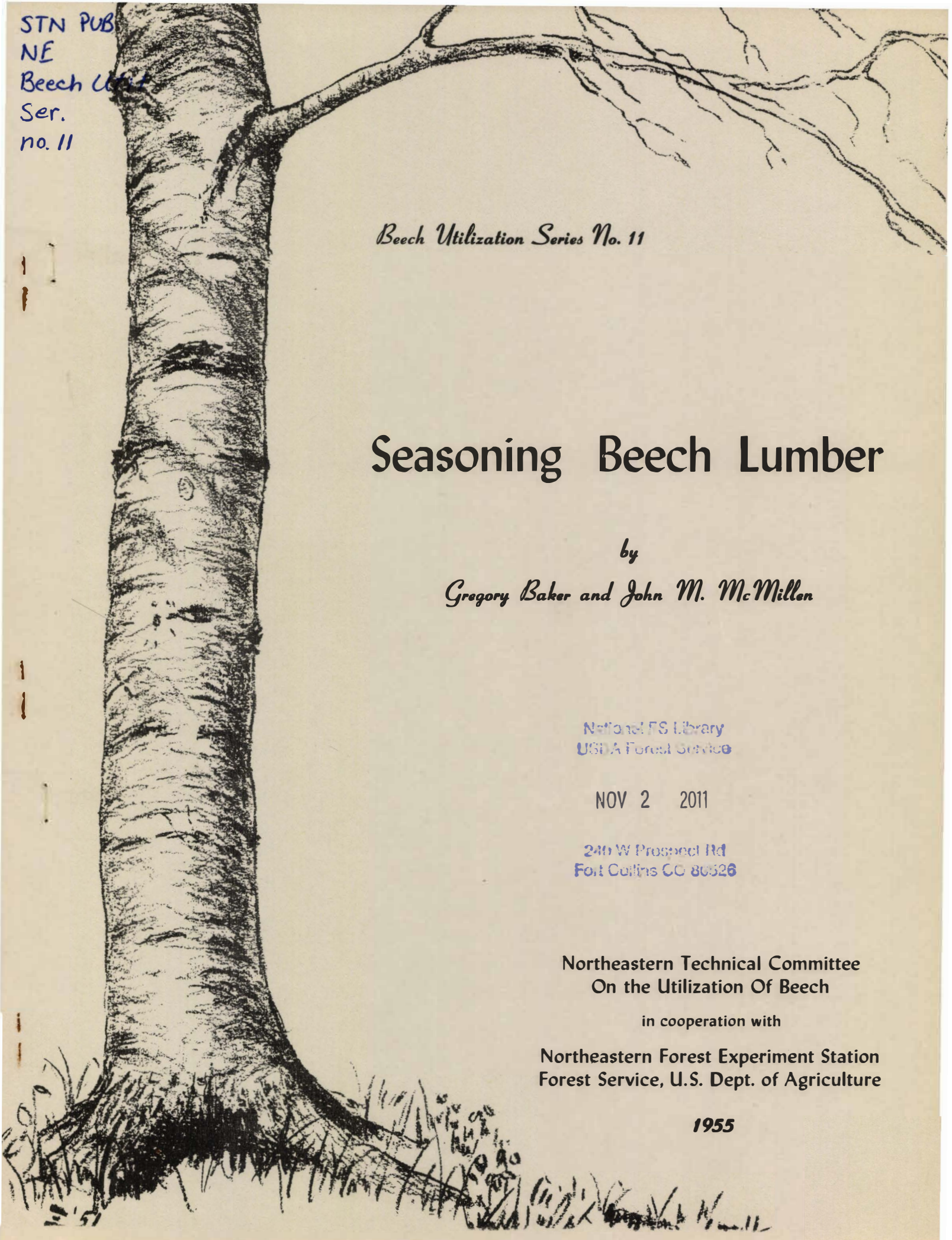

Beech Utilization Series No. 11

Seasoning Beech Lumber

by

Gregory Baker and John M. McMillen

Northeastern Technical Committee
On the Utilization Of Beech

in cooperation with

Northeastern Forest Experiment Station
Forest Service, U.S. Dept. of Agriculture

1955

FOREWORD

The wood of the American beech tree (Fagus grandifolia Ehrh.) is well suited for a large number of uses, and it is rather widely used by manufacturers. Yet the amount used is not in proportion to the amount that grows in our northeastern forests. The utilization of beech--both in the woods and in the factory--has been recognized as a problem.

One reason for this is in the nature of the wood: it has a reputation for being difficult to season. Another is that many of the beech trees in our forests are of poor quality. And there are some plain prejudices against beech.

Research is finding ways to utilize beech as efficiently as any of the other comparable hardwoods can be handled. Considerable information about beech has been gathered. Yet most of this information is available only in fragmentary form in scattered technical reports. Some of it has never been published.

To study the problems of putting beech to the uses it deserves, and to promote the better management of the forests in which it grows, a Northeastern Technical Committee on the Utilization of Beech was organized in 1949. This committee, which includes representatives of Federal and State forestry agencies, universities, and state experiment stations, decided to assemble and publish the available information about the utilization of American beech.

As its part of this cooperative project, the Northeastern Forest Experiment Station has undertaken to edit, publish, and distribute the series of reports that will contain this information.

The subjects of these reports will be as follows:

* Physical and mechanical properties of American beech.

(CONTINUED ON INSIDE OF BACK COVER)

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SEASONING BEECH LUMBER

by

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AMERICAN BEECH (Fagus grandifolia) has the reputation of being a very difficult wood to dry without serious loss. This reputation is justified by losses that have been experienced when the same methods were tried with beech that had been successful with other hardwoods. The purpose of this paper is to point out how such losses can be reduced by improved drying methods.

Beech has a great tendency to surface-check; so it requires extraordinary protection before drying and great care during drying. If the recommended practices and kiln schedules given in this paper are followed carefully, beech up to 1¼ inches thick can generally be dried check-free.

Checking can be expected for at least a portion of the thicker stock dried, but if recommended protection and drying procedures are followed the amount of checking can be kept to a minimum, and the checks will be small and tightly closed at the end of drying so that the wood will be suit-

able for most uses. For particularly critical uses additional measures, such as chemical treatment before drying (described later), may be desirable.

SEASONING CHARACTERISTICS

Shrinkage

Beech has a great tendency to shrink in the tangential direction (parallel to the growth rings). Total tangential shrinkage from green wood to 6 percent moisture content averages 8.8 percent (8).[1] This characteristic, along with the wood's high density, slow moisture movement (especially in the heartwood), and weak nature of the wood rays, is responsible for the wood's great tendency to surface-check and to be subject to other seasoning defects.

The great difference between radial and tangential shrinkage promotes cupping. Also, a certain percentage of beech has spiral grain and distorted grain; and this leads to longitudinal shrinkage and thus to twist, crook, and bow.

Checking

The outstanding seasoning characteristic of beech is its tendency to develop serious surface checks. If seasoning is carefully carried out to control surface-checking, most of the other seasoning defects will also be controlled.

Surface-checking is of two types. First, minute checks may occur in the individual rays. A great number of rays can be checked in the flattest grain portion of the lumber. In thick quarter-sawed stock, this kind of checking may occur on the edges. If severe drying conditions are avoided after such checks occur, they may close up and not penetrate deeply into the wood. But if not, these small checks may extend and join to form larger checks (fig. 1). It is possible, under severe drying conditions, for this larger type of check to occur without prior formation of the small checks.

[1] UNDERLINED NUMBERS IN PARENTHESES REFER TO LITERATURE CITED, PAGE 21.

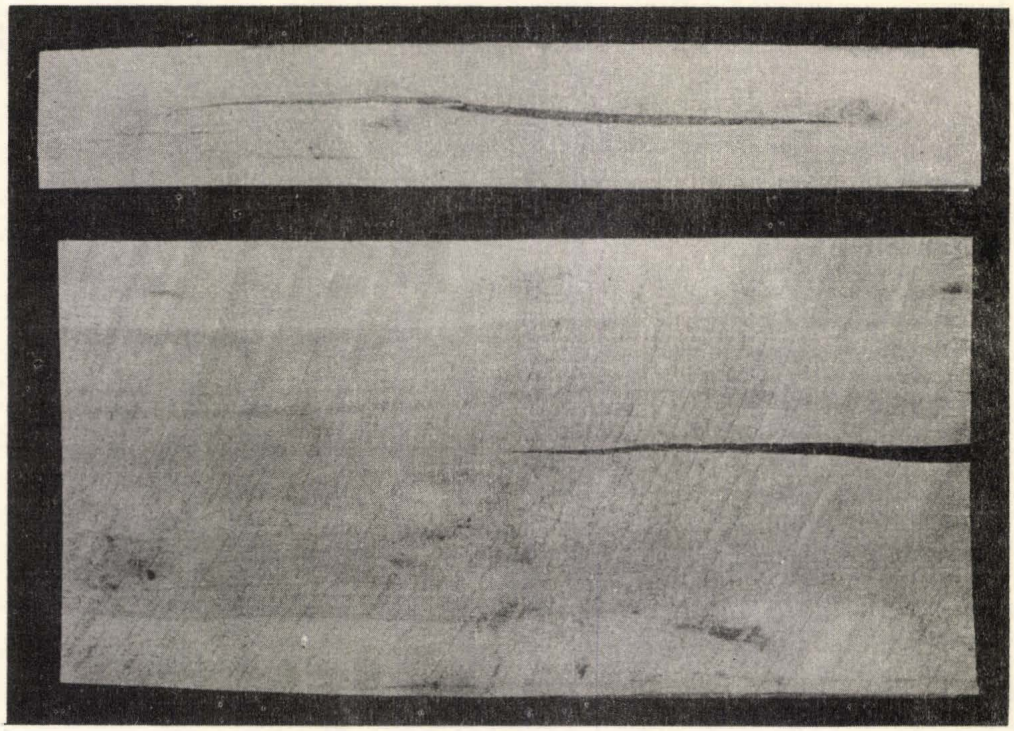

Figure 1.--Checking in beech lumber. Top, a surface check. Bottom, a deep end check.

Beech is also subject to end-checking, as other dense hardwoods are. The end checks may develop into deep splits (fig. 1). When the pith center is present in a board or square, a deep V-shaped check (fig. 2) may open up from surface or end checks. Beech is especially subject to this type of checking because of the big difference between tangential and radial shrinkage. Beech is also subject to honeycombing (fig. 2) as other dense hardwoods are.

Warping

Diamonding is a drying characteristic of all woods from which square stock is cut in which one face is not tangent to the growth rings (fig. 3). It tends to be severe in beech because of the difference between radial and tangential shrinkage. One New York operator saws his squares 1/8 inch oversize to allow for this diamonding.

The great difference between radial and tangential shrinkage also results in severe cupping in plain-sawed beech that is dried without any restraint to hold it flat (fig. 3). In fact, it is practically impossible to prevent all cupping in plain-sawed beech lumber cut from small trees even with the best of practices.

Bow, crook, and twist occur in a small portion of the lumber from beech trees having spiral grain. This is a result of longitudinal shrinkage. Also, a very small percentage has considerably distorted grain, causing sharp crooks and bows in the dried lumber in combination with twist. A piece of beech with a slight twist is shown in figure 4.

Casehardening

Beech is as subject to casehardening as other dense hardwoods. Where the stock has to be resawed, or where it has to be machined with deep

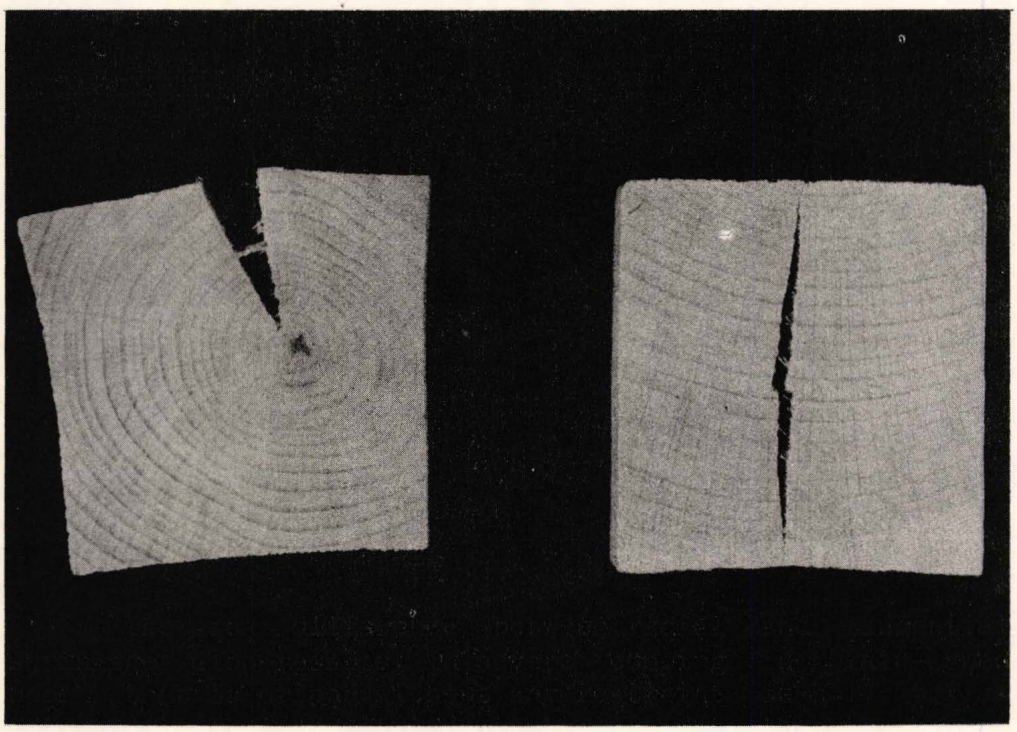

Figure 2.--Left, a deep check from surface to pith center. Right, honeycomb check.

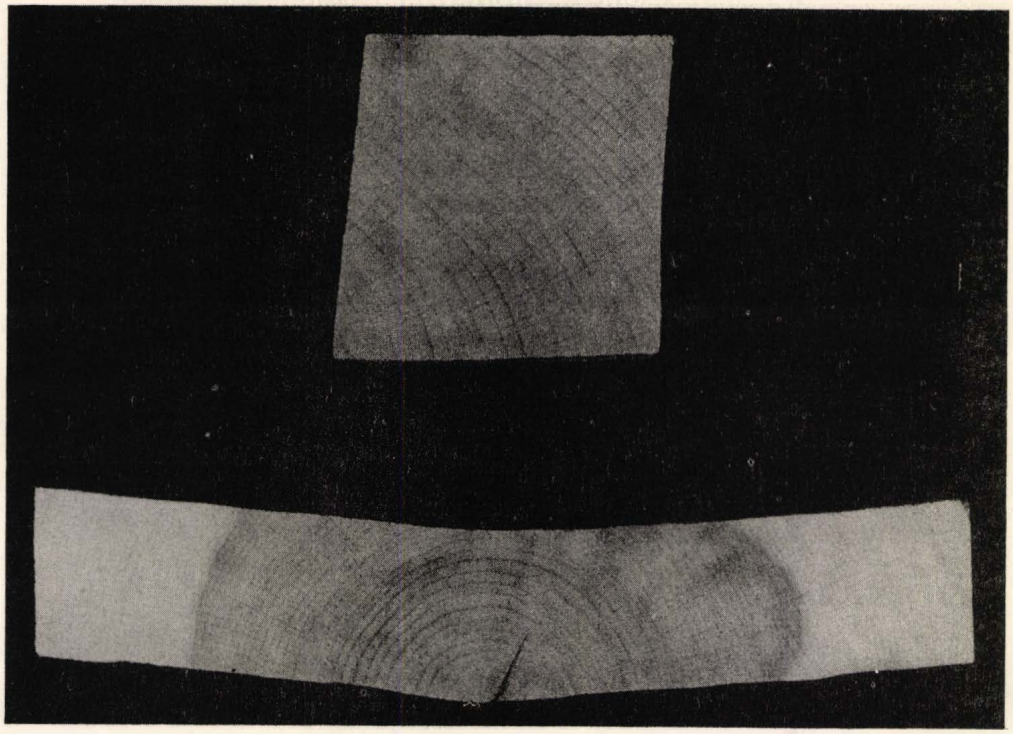

Figure 3.--Distortion in beech during seasoning. Top, an example of 'diamonding'. Bottom, an example of cupping.

cuttings or into irregular shapes, it will be necessary to condition the wood after kiln-drying to remove the case-hardening.

AIR DRYING (1)

Beech is a difficult species to air-dry without seasoning defects; and for this reason it has not been a popular wood. If check-free stock is required, there are certain practices that must be followed in air-drying. Basically these practices are aimed at preventing too rapid drying of the surface of the lumber. If this can be accomplished, most of the degrade due to seasoning can be avoided.

Protecting The Stock

Green beech lumber will start to surface-check within an hour or two if it is exposed to the hot sun or dry winds. Consequently

green beech lumber should be protected from such drying conditions until it is in the seasoning pile. Keep it under cover. Protect the top boards in an unfinished pile during intervals of waiting for more lumber. When the pile is finished, cover it at once with a watertight cover.

Location Of Piles

Locate your piles of beech lumber in the slowest drying areas in the lumber yard, that is, where air curculation is least and where the relative humidity is highest. Even under the most favorable conditions in the air-seasoning yard, it will be virtually impossible to produce completely check-free stock. Better results will be obtained if the lumber piles are placed in properly designed dry sheds. As stated previously, beech lumber may check in the early stages of drying and then these checks may close up in the later stages. If this happens to your beech, do not sell it to people who need check-free stock.

Sorting

Because of the nature of beech logs, the operator of a small long-log mill will have little chance to sort out heartwood and sapwood. He will have to handle the lumber in drying as though it were all heartwood. With a short-log bolter there is a better chance to separate the two types of wood, and the sapwood can be dried with less concern about checking. In either case the lumber should be sorted out by thicknesses, and also by lengths when practical. If you do not sort for length, box-pile to avoid overhanging ends.

Piling

When piles of beech lumber are built in the yard by hand it is generally best to make them 6 to 10 feet wide, and to space them 2 to 4 feet apart. The spacing depends on the exposure to wind currents: use narrow spacing where there is considerable air movement and wider spacing in protected locations where there is less air movement. Figure 5 illustrates the type of pile recommended when lumber is hand-piled. This plan calls for a sticker spacing of 2 feet. But if box-piling is practiced it will be necessary, in many cases, to use closer spacing to support short ends within the pile. Close spacing of stickers will also help to control warp.

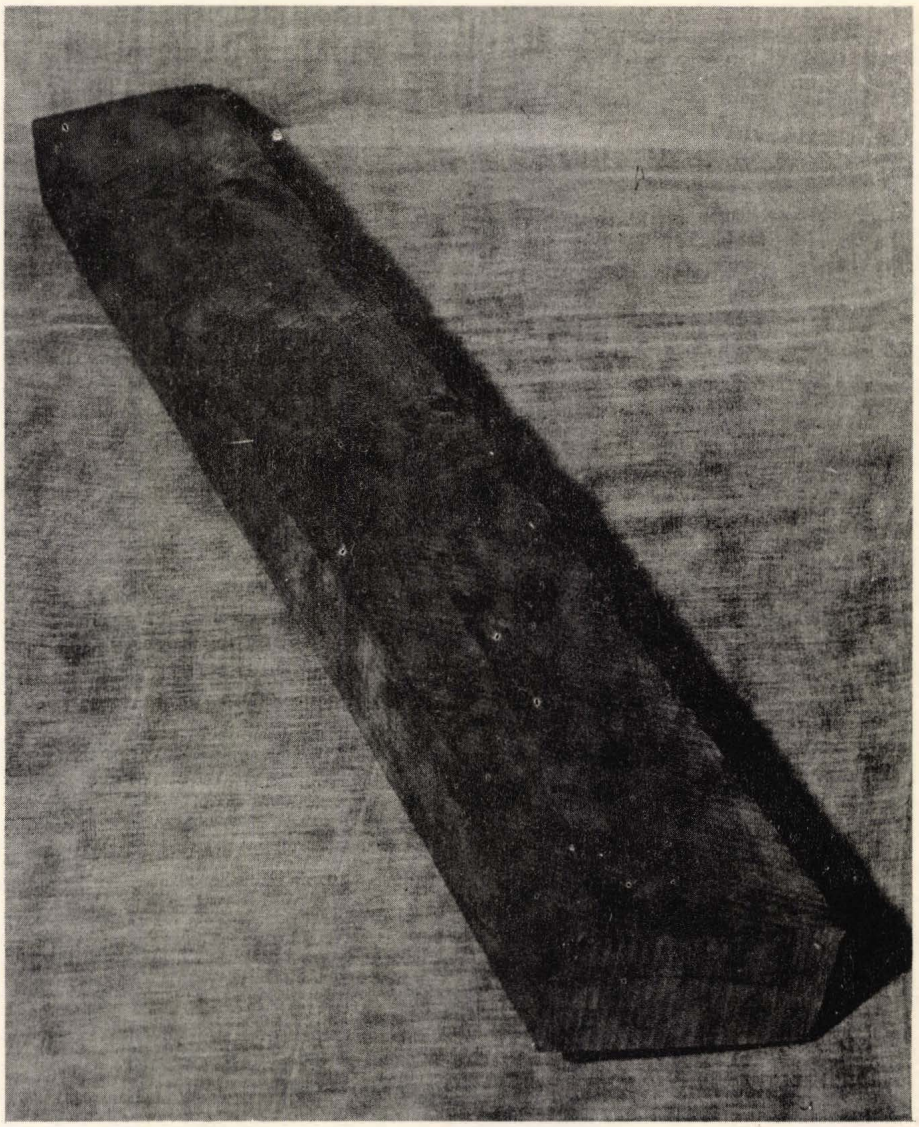

Figure 4.--Warping in beech lumber.

If the piles are built in the form of unit packages to be handled by a lift truck (usually only 4 feet wide), narrower spacing between the piles is generally necessary to keep air circulation slow and uniform.[2] Roofs should be

[2] PECK, E. C. AIR DRYING OF BEECH IN UNIT PACKAGE PILES. U.S. FOREST PROD. LAB. (UNPUBLISHED REPORT.) 1953.

used on top of each pile to prevent damage to the lumber from alternate wetting and drying, and to insure uniform drying of the lumber. Small portable roofs can be put in place with a lift truck, and they can be used over and over again.

Methods that can be used in air-seasoning beech dimension stock are shown in figures 6, 7, and 8. Where outdoor piles like these are used they should be closely spaced and they should be surrounded, if possible, by piles of other woods. Figure 6 shows a vertical-sided pile with a widely overhanging roof. Figure 7 shows vertical-sided piles with some overhang built in; also the tops of these piles are sloped so corrugated roofing can be laid directly on top. Figure 8 shows a flared pile with central flue. When beech dimension stock is piled in the yard, 3/4-inch stickers should be used instead of self-stickering, and the spaces between pieces should not be more than 1/4 inch. The flues should be very narrow, or omitted entirely.

Of course it is preferable to season beech dimension stock in a shed. Then self-stickering can be used--but the

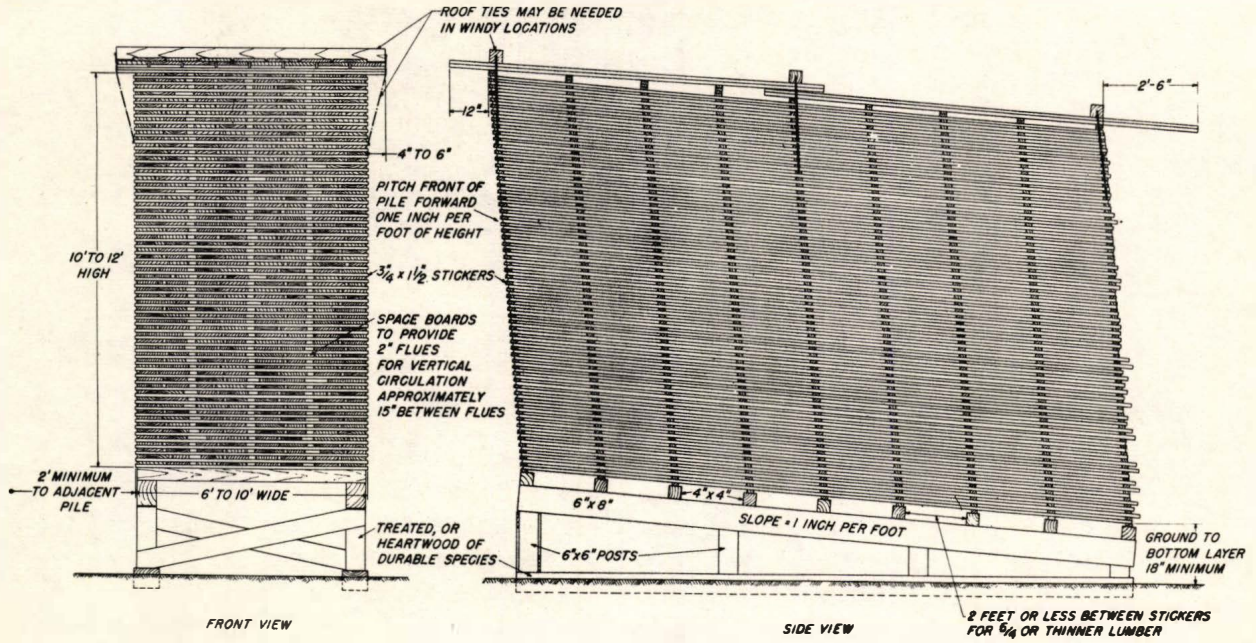

Figure 5.--The type of pile recommended for air-drying beech lumber, when the lumber is hand-piled.

spacing between pieces should be kept narrow. The piles within the shed should be laid out carefully to get uniform drying in all piles. A partial wall or louvers should be used on the windward side of the shed to reduce air movement, and the shed should have a floor 1 to 2 feet off the ground.

Some recommended methods of piling turning squares are described by Carter (2).

Drying Time

In the Philadelphia area, beech lumber has been air-dried from 55 to 20 percent moisture content in unit-package piles in 2½ months or less, when piled during the first 9½ months of the year. Lumber piled after October 15 did not dry to 20 percent until March.

End Coatings

For all beech lumber and dimension stock thicker than 1½ inches, it is recommended that a good end-coating material be used. This is especially important for dimension stock in which end-checking and splitting may cause excessive losses in trimming. End-coatings are applied to the end grain of the wood to prevent rapid loss of moisture from that surface. This allows more uniform drying of the wood and reduces the amount of end-checking caused by excessive shrinkage. Heart checks and splits caused by growth stresses in the tree cannot be controlled in this way. McMillen (4) discusses end-coatings in considerable detail. He states:

> ...The principal requirement of water resistant end-coating is adequate resistance to water movement under all conditions of temperature and humidity to which it may be subjected during the drying of the wood. Greater resistance is required for species of wood and types of material most susceptible to checking. To be effective in a single coat, a thick application is necessary. For satisfactory use in kiln-drying, the coating must be tough enough to withstand rough handling, strong enough to resist blistering caused by the expansion of the water vapor and air within the wood, and flexible enough to adjust itself to dimension changes as the wood dries.

He classifies end-coating materials into hot coatings and cold coatings. The hot coating must be heated before it

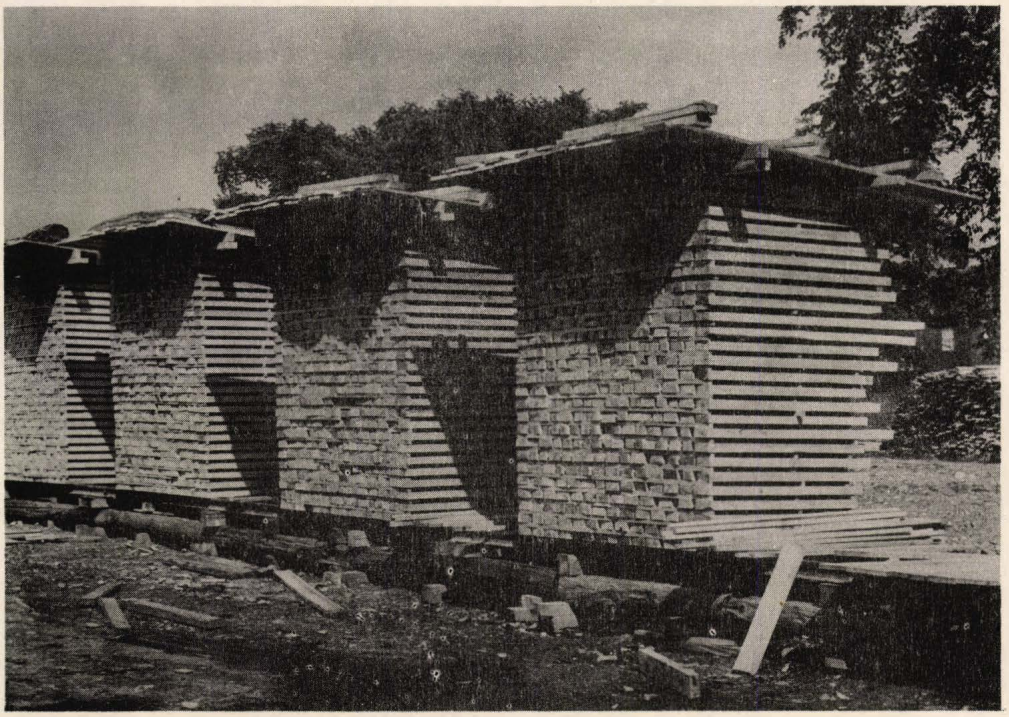

Figure 6.--A vertical-sided pile of dimension stock. Notice the good overhang of the roof.

is applied. A commonly used hot coating is paraffin: it is effective in one thick coat, it adheres well to the wood, and it can be applied at relatively low temperatures (135° to 150° F.). Another example of a hot coating is rosin and lampblack, which is a mixture (by weight) of 7 parts lampblack to 100 parts rosin. The temperature of application is approximately 300° F. This coating will stand kiln temperatures of 170° F. and will retain high water resistance.

While ordinary paints and varnishes are too thin for use as end-coatings unless several coats are used, a simple and effective end-coating is a heavy paste of a pigment such as white lead in a vehicle such as linseed oil. The paste should be made with only enough oil to allow its application with a trowel or a stiff brush.

An effective end-coating used at the U. S. Forest Products Laboratory is filled hardened gloss oil (4). The

gloss oil is made according to the following formula:

Rosin	100 parts by weight
Hydrated lime	6 to 8 parts by weight
Mineral spirits . . .	57.5 parts by weight

This gloss oil is filled by thoroughly mixing in 25 parts by weight of barytes and 25 parts of magnesium silicate with 100 parts of hardened gloss oil.

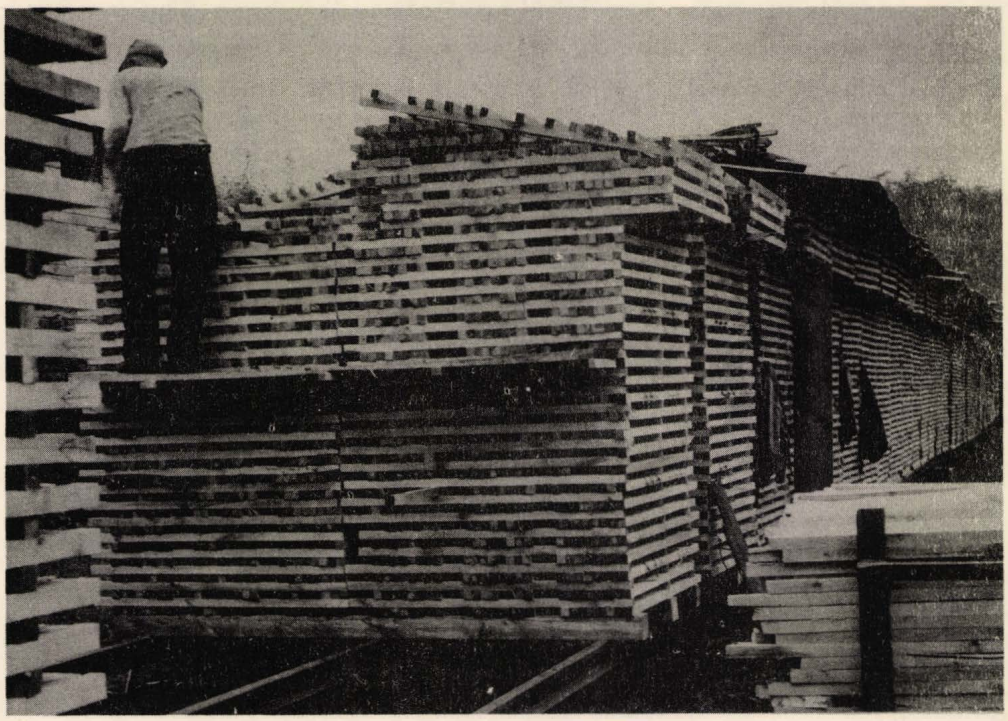

Figure 7.--Piling turnery squares. Here some overhang is built into the pile, and the top is sloped so corrugated roofing can be laid directly on top.

Other end-coatings used at the Forest Products Laboratory are discussed by McMillen (4). Several proprietary end-coatings are on the market, but information about their comparative effectiveness is not available. Several manufacturers of end-coatings are listed in another publication in this series (No. 2: Storage of beech logs and bolts in the Northeast).

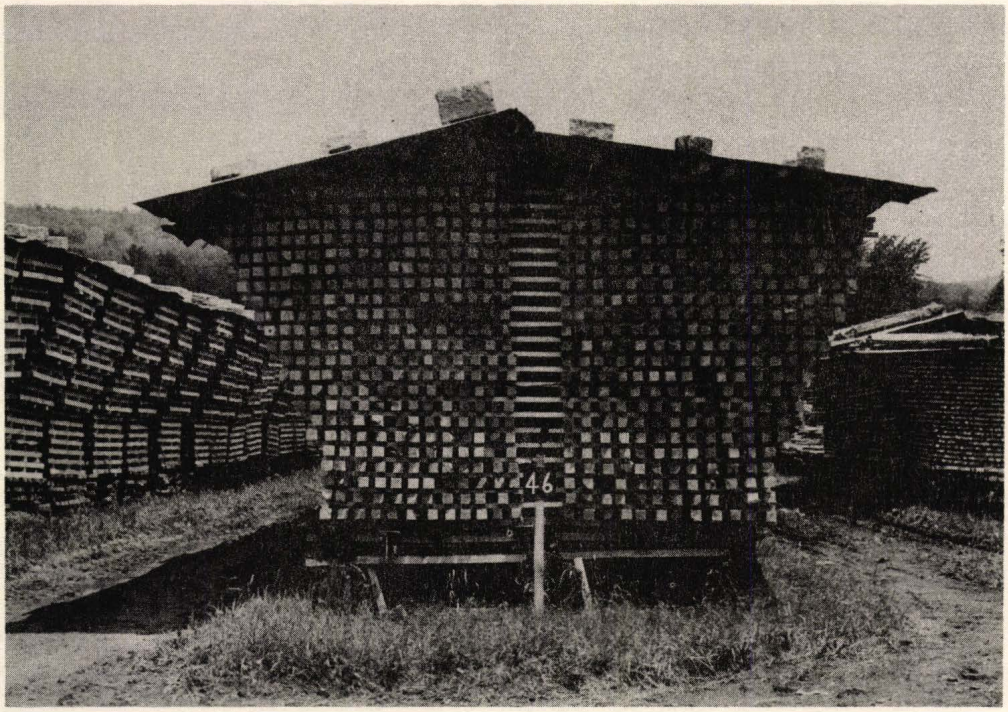

Figure 8.--Turnery squares stacked for drying in flared piles. In seasoning beech the flues in the piles should be kept small.

To be fully effective, end-coatings should be applied as soon as possible after the end surface is exposed. Once checking has started, much of the effectiveness of the coating will be lost.

KILN DRYING

Beech lumber and dimension stock can be dried green off the saw if the kiln provides for good automatic control of temperature and humidity and adequate and uniform air circulation. If a kiln with these minimum requirements is not available, no attempt should be made to kiln-dry green beech when check-free lumber is desired.

However, beech lumber that has been air-dried to 20 percent moisture content or less can be dried further in kilns that do not have automatic temperature and humidity control, without increasing the amount of seasoning defects

already present. The kiln conditions in such a case must be controlled manually to prevent excessively high temperature and excessively low relative humidity.

In short, proper air-seasoning, followed by kiln-drying to the final moisture content desired, will produce better material than kiln-drying in a kiln where the control of seasoning conditions is poor.

But kiln-drying in a good dry-kiln will produce better material than air-seasoning followed by kiln-drying--because drying conditions are under complete control throughout the process. Furthermore, only one handling of the material is necessary, dual drying systems need not be maintained, and quicker turnover of stock is attained.

In the following discussion of kiln-drying of beech, it is assumed that the stock is dried green off the saw and that check-free stock is desired.

Protecting The Stock

The same principles apply to the protection of stock going into a kiln as were suggested for air-drying; that is, keep the lumber under cover until the kiln charge is complete and ready to go into the kiln. Otherwise exposure to sun and drying winds will start uncontrolled drying and surface-checking will occur.

Piling

Use stickers of uniform thickness. Place the stickers not more than 2 feet apart and in vertical lines over the bunks of the kiln car. Keep the sides of the loads vertical, and with no board edges projecting. Use weights on top of the loads to reduce cupping in the upper layers. In forced-air cross-circulation kilns, place the boards in the courses edge to edge. In natural-circulation kilns, space the boards apart on the stickers or build flues in the piles, depending on the particular type of natural-circulation kiln used.

Schedules

The following schedules (pages 15-16) are the latest recommendations of the U. S. Forest Products Laboratory for kiln-drying green beech (7). They

are intended primarily for use in compartment kilns with fast air circulation where conditions on the wood are most nearly like those of the conditioned air. Air velocities of 200 to 350 feet per minute through the kiln load are quite common in forced-air-circulation kilns. For air velocities much less than these, the initial wet-bulb depressions can be increased somewhat. For natural-circulation kilns, the wet bulb depressions can be increased as much as 4° F.

Torgeson (7) has the following to say about the use of these schedules in progressive kilns:

> ...In a progressive kiln, the green end is usually operated at a rather low temperature and a high relative humidity as compared to the conditions at the dry end. In some progressive kilns, only the dry end is under temperature and humidity control. The initial and final conditions in these schedules can be used as a guide in selecting the proper conditions for the green and dry ends of the kiln. For refractory items, there would be danger in using the schedules in this way because the intermediate conditions are likely to be more severe in the progressive kilns. In such cases, a somewhat more conservative temperature and relative humidity schedule may be required, instead of the one recommended for compartment kilns.

There are certain characteristics in which these kiln schedules differ from older schedules:

- High initial humidity is maintained to insure minimum surface shrinkage.
- Changes to lower stages of intermediate relative humidity are made rapidly.
- When the moisture content of the center is below the critical stages the increase in temperature is rapid.

These schedules parallel closely those that are in use at some of the better wood-working plants in the Northeast.

The kiln schedules for previously air-dried beech are modifications of the schedules for green stock. The general procedure for modifying the schedules is given by Torgeson (7). It consists of using the same temperature schedule as

KILN-DRYING SCHEDULE
FOR GREEN 4/4 TO 6/4 BEECH LUMBER

Moisture content		Temperature		Wet bulb depression (°F.)	Relative humidity (%)	Equilibrium moisture content (%)
From— (%)	To-- (%)	Dry bulb (°F.)	Wet bulb (°F.)			
Initial	40	130	126	4	89	17.2
40	35	130	125	5	86	16.0
35	30	130	122	8	78	13.4
30	25	140	126	14	66	10.0
25	20	150	120	30	41	5.8
20	15	160	110	50	21	3.2
15	Final	180	130	50	26	3.3

To condition, set equilibrium moisture content 3% to 4% above final average moisture content percent for 16 to 24 hours.

KILN-DRYING SCHEDULE
FOR GREEN 8/4 BEECH LUMBER

Moisture content		Temperature		Wet bulb depression (°F.)	Relative humidity (%)	Equilibrium moisture content (%)
From— (%)	To— (%)	Dry bulb (°F.)	Wet bulb (°F.)			
Initial	40	120	117	3	91	19.0
40	35	120	116	4	88	17.4
35	30	120	114	6	82	15.1
30	25	130	120	10	73	12.1
25	20	140	115	25	46	6.9
20	15	150	100	50	18	2.9
15	Final	160	110	50	21	3.2

To condition, set equilibrium moisture content 3% to 4% above final average moisture content percent for 30 to 48 hours.

KILN-DRYING SCHEDULE
FOR GREEN 1-INCH BEECH SQUARES

Moisture content		Temperature		Wet bulb depression (°F.)	Relative humidity (%)	Equilibrium moisture content (%)
From-- (%)	To-- (%)	Dry bulb (°F.)	Wet bulb (°F.)			
Initial	40	130	125	5	86	16.0
40	35	130	123	7	81	14.0
35	30	130	119	11	71	11.5
30	25	140	121	19	56	8.4
25	20	150	115	35	35	5.0
20	15	160	110	50	21	3.2
15	Final	180	130	50	26	3.3

To condition, set equilibrium moisture content 3% to 4% above final average moisture content percent for 16 to 24 hours.

KILN-DRYING SCHEDULE
FOR GREEN 2-INCH BEECH SQUARES

Moisture content		Temperature		Wet bulb depression (°F.)	Relative humidity (%)	Equilibrium moisture content (%)
From-- (%)	To-- (%)	Dry bulb (°F.)	Wet bulb (°F.)			
Initial	40	120	116	4	88	17.4
40	35	120	115	5	85	16.2
35	30	120	112	8	77	13.4
30	25	130	116	14	64	10.0
25	20	140	110	30	38	5.8
20	15	150	100	50	18	2.9
15	Final	160	110	50	21	3.2

To condition, set equilibrium moisture content 3% to 5% above final average moisture content percent for 30 to 48 hours.

for green stock, but adjusting the humidity schedule so that the first wet-bulb depression is used until the stock is down to 30 percent moisture content, the second wet-bulb depression is used from 30 percent to 25 percent, and so on. The modified humidity schedule should be followed for 1 to 3 days, then humidity should be shifted to the proper step of the schedule for green stock, depending on the moisture content of the kiln samples at that time. Examples of this method of modification for 1-inch lumber and 2-inch squares are shown in the schedules on page 18.

Time Required

The length of time required to kiln-dry beech varies greatly, depending on the efficiency of the kiln, the thickness and width of the lumber, the moisture content of the stock as it enters the kiln, and the final moisture content desired. However, several examples will serve to show what can be expected.

- One New York firm that dries 4/4 inch and 5/4 inch beech, averaging 8 inches wide, reports that 12 to 13 days are required (including conditioning) to dry lumber from an average of 60 percent moisture content to 6 percent. This firm uses a cross-circulation compartment kiln.

- Several pilot tests made by the author with a small demountable internal-fan kiln at the University of Maine indicated that 2-1/8 inch beech squares could be dried from 62 percent moisture content to 10 percent in 12 days--with no surface-checking and with end-checking confined to within 2 inches of the end surfaces.

- A firm in Maine seasons its beech for 6 to 8 months and then kiln-dries it in a natural-draft kiln. This firm reports that 6 days are required to dry 4/4 inch air-dried beech (16 to 20 percent moisture content) to 5 percent moisture content.

- As a result of drying experiments at the U. S. Forest Products Laboratory at Madison, Wis., Torgeson[3] reports that beech lumber 60 to 90 percent heartwood, 1 by $6\frac{1}{2}$ inches in dimension, partially air-seasoned to about 35 percent

[3] TORGESON, O. W. SUMMARY OF EXPERIMENTAL KILN RUNS ON BEECH FROM JANUARY 1946 TO JANUARY 1950. U.S. FOREST PROD. LAB. (UNPUBLISHED REPORT.) 1951.

KILN-DRYING SCHEDULE
FOR PARTIALLY AIR-DRIED 4/4 TO 6/4 BEECH LUMBER

Moisture content		Temperature		Wet bulb depression (°F.)	Relative humidity (%)	Equilibrium moisture content (%)
From-- (%)	To-- (%)	Dry bulb (°F.)	Wet bulb (°F.)			
Initial	30	130	126	4	89	17.2
30	25	140	135	5	87	15.8
25	20	150	142	8	80	13.0
20	15	160	110	50	21	3.2
15	Final	180	130	50	26	3.3

To condition, set equilibrium moisture content 3% to 4% above final average moisture content percent for 16 to 24 hours.

Note: In case the stock has been air-dried to less than 20% moisture content, start with the wet-bulb depression called for in the fourth step of the appropriate humidity schedule for green stock. When the samples are down to 15% moisture content, shift to 50° depression .

KILN-DRYING SCHEDULE
FOR PARTIALLY AIR-DRIED 2-INCH BEECH SQUARES

Moisture content		Temperature		Wet bulb depression (°F.)	Relative humidity (%)	Equilibrium moisture content (%)
From-- (%)	To-- (%)	Dry bulb (°F.)	Wet bulb (°F.)			
Initial	30	120	116	4	88	17.4
30	25	130	125	5	86	16.0
25	20	140	132	8	79	13.2
20	15	150	100	50	18	2.9
15	Final	160	110	50	21	3.2

To condition, set equilibrium moisture content 3% to 4% above final average moisture content percent for 30 to 48 hours.

Note: In case the stock has been air-dried to less than 20% moisture content, start with the wet-bulb depression called for in the fourth step of the appropriate humidity schedule for green stock. When the samples are down to 15% moisture content, shift to 50° depression.

moisture content, was kiln-dried to 6 percent in 7 to 10 days. The schedule used was essentially the same as the one given for air-drying squares.

CHEMICAL SEASONING

Use of chemicals before seasoning beech--either in the open air or in a kiln--has been recommended primarily to reduce checking. A hygroscopic material is most often recommended, because it will attract and hold moisture at the surface of the wood and thus prevent the surface from drying out before the inside layers are dry.

Many chemicals have been experimented with for chemical seasoning. The only commercial preparation now on the market is Morton's Lumber Cure, produced by the Morton Salt Company of Chicago, Ill. This is sodium chloride to which other chemicals have been added to prevent rusting of tools and machinery that may come into contact with it.

The chemical is generally applied at the rate of 75 to 100 pounds of salt to 1,000 board feet of lumber. It may be applied by spreading dry on the surface of the green lumber, which is then bulk-piled and covered to protect it from sun and rain. If the trees the lumber was cut from have a naturally low moisture content, it may be necessary to wet the surface of the lumber before spreading the salt. There must be enough moisture to get the chemical into solution. After 1 to 2 weeks, depending on thickness, the lumber is moved from the bulk pile and started through the seasoning process.

A second method of application is to make a water solution, thicken it with starch or some other thickening agent, and dip the lumber in it. To get proper gelation of the thickening agent, you may have to add it to the water before adding the salt. After this method of application, bulk-piling is not necessary; the lumber goes directly to the seasoning process.

An evaluation of Morton's Lumber Cure as a chemical seasoning agent for beech was made at Old Town, Maine, using 2-1/8 inch by 4-5/8 inch beech averaging 4 feet long (5). In this test the stock was divided into four matched groups. Three groups were treated: one by spreading on dry salt and bulk-piling under canvas for 6 days; the second by dipping in a solution thickened with starch; the third by spraying

the lumber with the thickened solution after piling. The fourth group was untreated. Difficulties were encountered with equipment and procedure in the dipping and spraying treatments, and final results were not as good as with dry spreading.

After treatment the lumber was piled for air-drying in the manner commonly used at this plant. The lumber was air-seasoned to about 20 percent moisture content, then was kiln-dried to 5 percent.

Both the treated and the untreated beech was then manufactured into small bowls, along with an equal volume of yellow birch, which is commonly used for this product. The effectiveness of the salt treatment was judged by the number of the bowls rejected for seasoning defects:

Treatment	Bowls rejected per 1,000 linear feet of lumber
	(Number)
Untreated beech	152
Untreated yellow birch	65
Beech, dry-spread	62

So far the work in chemical seasoning of beech has been limited in scope, and the effectiveness of the method as indicated in these trials shows a need for more comprehensive field tests. Costs, procedures, and handling techniques need to be worked out. Chemical treatment may be the answer to production of check-free beech when air-seasoning must be depended upon. It should effectively reduce seasoning defect when beech lumber must be dried in kilns that do not provide good control over seasoning conditions.[4] Small mills may find this treatment useful in protecting lumber during the time required to assemble a kiln charge.

[4] TORGESON (SEE FOOTNOTE 3) REPORTS DEFINITE REDUCTION OF CHECKING IN HEARTWOOD PIECES OF 2- BY 8-INCH BEECH AS COMPARED WITH UNTREATED STOCK IN THE SAME KILN CHARGE.

Loughborough (3) offers the following conclusions about chemical seasoning:

> Chemical seasoning is potentially a vital tool that the industry may use profitably when the public insists on check-free lumber that is dried to a specified moisture content. At present, there may be any number of opportunities to use profitably chemical-seasoning methods in drying specialty items.

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AGRICULTURE-FOREST SERVICE-UPPER DARBY

(CONTINUED FROM INSIDE OF FRONT COVER)

* Chemistry and chemical utilization of beech.
Management of beech.
Beech availability and supply.
Present markets and uses for beech.
* Methods of logging beech.
* Seasoning of beech.
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Beech for fuel and charcoal.
Beech for cross ties.
* Beech for containers.
Pulping and defiberization of beech.
Rough construction on the farm with beech.

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The information gathered in this widespread cooperative project should be of great use to the wood-using industries of the regions where the wood of American beech is available.

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